DEPARTMENT OF THE NAVY

NAVAL FACILITIES ENGINEERING COMMAND

200 STOVALL STREET

ALEXANDRIA. VA 22332.2300

IN REPLY REFER TO

04AI/CMM

27 Jan 1992

Design Policy Letter DPL-92-0001

FROM: Commander, Naval Facilities Engineering Command

Subj: DESIGN GUIDANCE FOR ELECTRICAL POWER SYSTEMS SERVING NONLINEAR HARMONIC LOADS

Ref: (a) Federal Construction Council Report No. 112, dtd 1 Nov 91

1. Purpose : To provide design guidance for electrical power systems serving large concentrations of personal computers and industrial loads. This guidance applies to all facilities where the estimated harmonic load exceeds 15 to 20 percent of the total building electrical load.

2. Background: The majority of new government facilities and retrofit design project8 will Include upgraded Electrical Utility Services for personal computers, automatic data processing systems, electronic office equipment, electronic ballasts, and solid state motor control equipment which may contain switching mode power supplies.

This equipment, when connected to conventional building wiring systems, can create overheating of transformers, generators, motors, and the interconnected building wiring system. The excessive neutral currents are the result of harmonic currents within the office equipment switching mode power supplies. The resulting overtemperature conditions may damage the insulation within transformers, motors, generator8 and cable systems. Reference (a), recently issued by the Federal Construction Council, provide8 additional information and references.

3. Policy Statement: It is Naval Facilities Engineering Command (NAVFACENGCOM) policy to use the following design practice8 when designing electrical distribution systems for facilities which must accommodate nonlinear and harmonic loads. Typical facilities Include communications center8 laboratories, data processing and administrative building8 with 15 to 20 per cent of connected harmonic load.

(a) Electrical Design Analysis Shall include a calculation of estimated nonlinear loads.

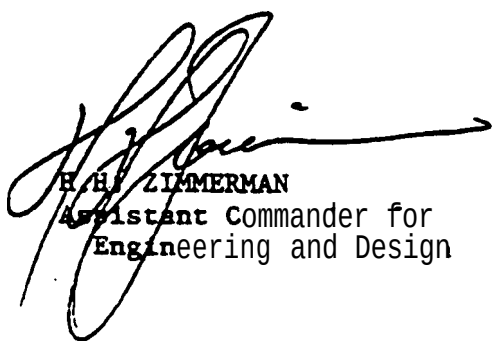
(b) Transformers shall he selected using procedure8 outlined in ANSI C57.lll-1986. This standard provide8 a simple calculation method for determining derating factors for low voltage, dry type distribution transformers. Electrical Designers should consider using "K" rated transformers which are rated for 220 degree centigrade maximum hot spot temperature operation. This design procedure will ensure that the transformer life expectancy will not be reduced when connected to nonlinear loads.

(C) Building Wiring Systems shall include dedicated neutral conductors for each 120 volt outlet serving nonlinear equipment. Shared neutral conductors shall not be used for outlets connected to different phases of the same electrical distribution panel. Where shared neutral conductors are used for 208/120 volt systems provide a neutral rated for 1.73 times the ampacity of the paralleled phase conductors. Two paralleled neutral conductors, each having the ampacity of the phase conductors may be required. Where double-sized neutrals are not feasible or practical consider a neutral overcurrent sensor to trip an upstream circuit breaker without Interrupting the neutral conductor.

(d) Construction Cost. The above policy will Increase the construction cost of the typical facility by a nominal percentage. This cost increase is justified to provide the customer a more flexible facility and will result In a reduced life cycle maintenance cost.

4. Action: NAVFACENGCOM Engineering Field Divisions, Public Work Centers, and Public Works Departments, shall Incorporate this criteria Into the design of new buildings and for modifications to existing facilities, which include a high concentration (15 to 20 X) of harmonic loads. Scopes of work for Architect/Engineer designs must contain this criteria.

5. Point of Contact: For further information please contact Mr. Charles Mandeville at NAVFACENGCOM Headquarters, Autovon 221-0069 or commercial (703) 325-0069



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